

22 December 1954

SUPERSEDING

NAVORD OS 1671 (in part)\*

## MILITARY SPECIFICATION

### PLATING, BLACK NICKEL (ELECTRODEPOSITED) ON BRASS, BRONZE, OR STEEL

#### 1. SCOPE

1.1 Scope. - This specification covers one type, class, and grade of plating, black nickel (electrodeposited) for blackening brass, bronze and steel surfaces, applicable where a minimum distraction of the operators vision is desired as in the interior of optical instruments.

#### 2. APPLICABLE DOCUMENTS

2.1 The following specifications, and standards, of the issue in effect on date of invitation of bids, form a part of this specification:

##### SPECIFICATIONS

###### MILITARY

JAN-B-121 - Barrier Materials, Greaseproof

###### NAVY DEPARTMENT

General Specifications for Inspection of Material together with Appendix II (Metals), Definitions and Tests.

##### STANDARDS

###### MILITARY

MIL-STD-105 - Sampling Procedures and Tables for  
Inspection by Attributes.

MIL-STD-129 - Marking of Shipments.

\*(See 6.4)

MIL-P-18317 (NOrd)

(Copies of Specifications, and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer)

3. REQUIREMENTS

3.1 Materials.- The materials shall produce black nickel plating, (see 6.1) which meets the requirements of this specification.

3.2 Component part.

3.2.1 Basis metal. - The basis metal shall be free from visible defects that will be detrimental to the appearance or performance of the black nickel plating.

3.2.2 Black nickel plating (electrodeposited, see 6.3).

3.3 Application of black nickel plating.-

3.3.1 General.- Unless otherwise specified, in the contract or order (See 6.2), the black nickel plating shall be applied to the basis metal without intermediate coating after all mechanical operations on the basis metal, such as machining, brazing, and perforating of the articles, have been completed.

3.3.2 Intermediate coating.- When specified in the contract or order (See 6.2), an intermediate coating such as nickel plating shall be applied to the steel basis metal for the purpose of improving the corrosion protection.

3.4 Detail requirements.-

3.4.1 Color of the deposit.- The deposit shall be a uniform black color which shall conform to the color of the standard sample approved under 4.2.1.

3.4.2 Coverage of the deposit.- The black nickel plating shall completely cover all surfaces designed on the applicable drawings (for example, all surfaces where reduction of light reflection is desired).

3.4.3 Adhesion.- The black nickel plating shall not separate from the basis metal or the intermediate coatings and the intermediate coating from the basis metal at the interfaces and shall not crack, peel, or chip when subjected to the adhesion test in 4.4.2 and to handling likely to be encountered in production, shipping, use, or overhaul of equipment. The interface between the black nickel plating and the basis metal or an intermediate coating in the surface of the basis metal or the intermediate coating before painting.

3.5 Workmanship.- The workmanship shall be in accordance with high grade commercial practice as required by conditions of use and for good appearance. The plating shall be smooth, adherent, and free from powdery deposits, blisters, pits, nodules, and indications of burning.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Lot.- A lot of plated articles shall consist of parts of approximately the same size and shape, plated as defined in 6.3, and submitted for inspection at one time.

##### 4.2 Sampling.-

4.2.1 Standard Sample.- Prior to production, six specimens of the black nickel plating shall be prepared at the same time and shall be uniform in appearance. Three shall be submitted to the inspector and three shall be retained by the manufacturer. After approval, the specimens retained by the manufacturer shall be considered standard color samples for subsequent production. The specimens retained by the manufacturer shall be carefully stored to avoid contamination of the surface and change in color.

##### 4.2.2 Lot acceptance samples.-

4.2.2.1 For visual inspection.- Samples of each lot of plated articles shall be selected in accordance with the provisions of Standard MIL-STD-105 for visual inspection in accordance with 4.2.2 thru 4.2.2.2.1 inclusive.

4.2.2.2 For adhesion test.- A random sample of four items shall be taken from each inspection lot by the inspector for the adhesion test in 4.4.2 or four separately plated specimens shall be prepared in accordance with 4.2.2.2.1 to represent the applicable tests for each inspection lot. If the number of the items in the inspection lot is four or less the number of items in the sample shall be determined by the procuring activity or left to the discretion of the inspector.

4.2.2.2.1 Separate specimens.- When the plated articles are of such form as to be not readily adaptable to the adhesion test or at the discretion of the inspector for the sampling of small lot sizes for a destructive (adhesion) test, the test may be made by the use of separate specimens plated concurrently with the articles represented. The separate specimens shall be of a basis metal equivalent to that of the articles represented.

"Equivalent" basis metal includes chemical composition and finish of surface prior to plating unless otherwise approved by the Government inspector. The separate specimens may be strips approximately 1-inch wide, 4-inches long, and 0.04-inch thick for adhesion tests. These specimens shall be introduced into a lot at regular intervals prior to the cleaning operation preliminary to plating and shall not be separated therefrom until after completion of the processing. Conditions affecting the plating, including the spacing and positioning with respect to anodes and to other objects being plated shall correspond as nearly as possible to those affecting the significant surfaces of the articles represented.

#### 4.3 Inspection.-

4.3.1 Materials and processes.- Material and processes used in the production of black nickel platings shall be subjected to inspection during the course of production by the Government inspector. The inspector shall be given all necessary facilities to determine conformance to the requirements of this specification. Inspection shall be in accordance with General Specifications for Inspection of Material.

The Government inspector will evaluate the results obtained in all official inspections and tests, and will base acceptances and rejections thereon. However, in cases of doubt or disagreement, the matter shall be referred in detail to the procuring activity for final decision, except as limited by any applicable provision in the contract.

4.3.2 Lot acceptance inspection.- Lot acceptance inspection shall be based on a visual inspection for coating (see 4.3.2.1) and color (see 4.3.2.2) in accordance with the sampling plans of Standard MIL-STD-105 at an Inspection Level II and an Acceptance Quality Level of 2.5 percent defective.

4.3.2.1 Coating.- Each item for sample 4.2.2 shall be visually inspected for plating smoothness, and freedom from powdery deposits, blisters, pits, nodules, and indications of burning, completeness of coverage in 3.4.2, and adhesion in 3.4.3, and tested for adhesion according to 4.4.2.

4.3.2.2 Color.- Each item of 4.2.2 shall be compared for color with a standard sample, 4.2.1, conforming to the requirements as specified in 3.4.1.

#### 4.4 Tests.-

4.4.1 Lot acceptance.- Failure of one or more of the test specimens selected for the adhesion test in 4.4.2 shall constitute failure of the lot.

4.4.2 Adhesion test.-- Adhesion shall be determined on the plated article by cutting the plating from the basis metal at the interface(s) in a continuous path and examining at four diameters magnification to determine whether removal has been caused by the cutting away of an adherent plate or by the lifting of a non-adherent plate.

4.5 Rejected lots.-- Rejects lots may be resubmitted for inspection as specified in 4.3.2, after stripping and replating, or after screening of the entire lot by the manufacturer. Full particulars concerning replating shall be furnished, and approved, by the inspector or procuring agency.

## 5. PREPARATION FOR DELIVERY

5.1 Packaging.-- The items shall be clean, dry, covered with wrappings or with barrier material in accordance with Specification JAN-B-121, Grade A to prevent chafing or impairment of the plating during transportation from the point of manufacture to the place of delivery.

5.2 Packing.-- Unless otherwise specified in the contract or order (see 6.2) all items shall be packed in such a manner as to insure acceptance by common or other carrier for safe transportation to the point of delivery. If special packing is necessary for this purpose, such packing shall be provided by the contractor without additional expense to the Government. Parts received in a damaged condition or having the plating impaired, shall be returned to the contractor at his expense for stripping and replating.

5.3 Marking.-- In addition to any special marking required by the contract or order (See 6.2), shipping containers shall be marked in accordance with Standard MIL-STD-129.

## 6. NOTES

6.1 Intended use.-- Black nickel plating is intended primarily for use on brass, bronze, or steel instrument parts and is applied for the purpose of producing black non-reflective surfaces.

6.2 Ordering data.-- Procurement documents shall provide the following:

- a. Title, number, and date of this specification.
- b. Specify if intermediate coating is required for steel (See 3.3.1 and 3.3.2)
- c. Packing regulations, if different (See 5.2)
- d. Additional marking, if necessary (See 5.3)

MIL-P-18317 (NOrd)

6.3 Definition of black nickel plating.- Black nickel plating is defined as the black deposit obtained by electro deposition from a typical black nickel plating solution of the following composition and operating conditions:

<u>Composition</u>	<u>Ounces per gallon</u>
Nickel Ammonium Sulphate ( $\text{NiSO}_4 (\text{NH}_4)_2 \text{SO}_4 \cdot 6\text{H}_2\text{O}$ )	8.0
Zinc Sulphate $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$	1.0
Sodium Thiocyanate ( $\text{NaCNS}$ )	2.0

  

<u>Operating Conditions</u>	
Temperature	75-95°F
pH	5.8-6.1 (electrometric)
Cathode current density	0.5-1.5 amp/ft <sup>2</sup>
Plating time	20 to 40 minutes

The above formula is typical of the thiocyanate baths employed for black nickel plating. Other formulas for black nickel solution producing an equivalent coating may be used.

6.4 Superseding information.- This specification supersedes Type A of NAVORD OS 1671 for (Electrodeposited) Black Nickel Plating.

Patent notice. - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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(See Instructions - Reverse Side)

1. DOCUMENT NUMBER

2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

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OTHER (Specify) \_\_\_\_\_

b. ADDRESS (Street, City, State, ZIP Code)

## 5. PROBLEM AREAS

a. Paragraph Number and Wording.

b. Recommended Wording

c. Reason/Rationale for Recommendation.

## 6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

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